

## What is Claimed is:

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Q1
- [c1] A method for forming a transistor, the method comprising the steps of:
    - a) providing a semiconductor substrate;
    - b) providing an epitaxial layer on a substrate;
    - b) providing a dopant source layer on the epitaxial layer;
    - c) diffusing dopant from the dopant source layer into the epitaxial layer, said dopant diffusion forming at least a portion of an extrinsic base for the transistor.
  - [c2] The method of claim 1 wherein the dopant source layer comprises a doped single crystal layer formed on the epitaxial layer.
  - [c3] The method of claim 2 wherein the dopant source layer is doped between  $5 \times 10^{19}$  and  $1 \times 10^{21}$  atoms/cm<sup>3</sup>.
  - [c4] The method of claim 1 further comprising the step of implanting into epitaxial layer, the implanting forming a second portion of the extrinsic base for the transistor.
  - [c5] The method of claim 1 further comprising the step of forming a pedestal on the epitaxial layer, and wherein the dopant source layer is formed around the such that the pedestal defines a portion of the epitaxial layer in which the dopant source layer is not formed on the epitaxial layer.
  - [c6] The method of claim 5 wherein the pedestal further defines an emitter opening.
  - [c7] The method of claim 5 wherein the step of forming a pedestal comprises forming a high pressure oxide layer, a nitride layer, and an oxide layer, and patterning the high pressure oxide layer, nitride layer and oxide layer.
  - [c8] The method of claim 5 wherein the step of forming a pedestal comprises depositing and patterning an oxide layer.
  - [c9] The method of claim 1 wherein the dopant source layer comprises a raised portion of the extrinsic base.
  - [c10] A method for forming bipolar transistor on a semiconductor substrate, the

method comprising the steps of:

- a) providing a semiconductor substrate;
- b) forming an epitaxial layer on the semiconductor substrate;
- c) forming a pedestal on epitaxial layer, the pedestal defining an emitter region of the epitaxial layer;
- d) forming a dopant source layer on the epitaxial layer, the dopant source layer not formed on the epitaxial layer where the pedestal is on the epitaxial layer;
- e) diffusing dopant from the dopant source layer and into the epitaxial layer to form at least a portion of an extrinsic base.

- [c11] The method of claim 10 wherein the epitaxial layer comprises silicon germanium.
- [c12] The method of claim 10 wherein the step of forming a pedestal comprises forming a high pressure oxide layer, a nitride layer, and an oxide layer, and patterning the high pressure oxide layer, nitride layer and oxide layer.
- [c13] The method of claim 10 wherein the step of forming a pedestal comprises depositing and patterning an oxide layer.
- [c14] The method of claim 10 wherein the dopant source layer comprises a raised portion of the extrinsic base.
- [c15] The method of claim 10 further comprising the step of implanting into epitaxial layer, the implanting forming a second portion of the extrinsic base for the transistor.
- [c16] The method of claim 10 wherein the dopant source layer is self-aligned to the pedestal.
- [c17] A transistor formed on a semiconductor substrate, the bipolar transistor comprising;
  - a) an epitaxial layer on the semiconductor substrate;
  - b) a dopant source layer on the epitaxial layer;
  - c) dopants from the dopant source layer diffused into the epitaxial layer to form at least a portion of the extrinsic base for the bipolar transistor.

- [c18] The transistor of claim 17 wherein the dopant source layer comprises a doped single crystal layer formed on the epitaxial layer.
- [c19] The transistor of claim 17 wherein the epitaxial layer comprises a silicon germanium layer.
- [c20] The transistor of claim 17 the dopant source layer is doped between  $5 \times 10^{19}$  and  $1 \times 10^{21}$  atoms/cm<sup>3</sup>.
- [c21] The transistor of claim 17 wherein the dopant source layer comprises a raised portion of the extrinsic base that is coupled to the dopants diffused from the dopant source layer.